Order no. 6230-9-				
DC-B-026	1			
2Phase-041	2			
25 mm (xy mounted at PI miCos)		1		
50 mm		2		
75 mm		3		
100 mm		4		
150 mm		5		
200 mm		6		
250 mm		7		
300 mm		8		
Single axis				0
25 mm xy mounted				1

VT-80 Translation Stage

Order no. 6230-9-

User Manual

Version: **01.000** Date: 31.07.2015

PI miCos

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Subject to change without notice. This manual is superseded by any new release. The respective current revision is available for download on our website (http://www.pimicos.com).
File name:FILE-001438008_0001_MAN_VT-80_9_EN.DOCX.pdf Document-ID:**DOC-000261817**

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1. ABOUT THIS DOCUMENT

All specifications in this user manual refer only to the standard products that are included in the PI-miCos catalog. Any special features that are different, in particular special requests from customers, are supplied with the user manual as additional documentation in the form of "Technical Notes".

1.1 Objective and Target Group of this User Manual

- This user manual contains all information required for the intended use of the VT-80.
- Basic knowledge on servo systems, motion control concepts and applicable safety measures is assumed.
- The latest version of the user manual and answers to any questions can be obtained from our customer service department (see chapter 9)

1.2 Symbols and Typographic Conventions

The symbols and typographic conventions used in this manual have the following meanings:

NOTICE

Dangerous situation!
If not avoided, the dangerous situation will result in death, injuries or damage to the equipment
-> Actions to take to avoid the situation

NOTICE

Information for easier handling, tricks, tips, etc.

1.3 Other Applicable Documents

All products and programs from PI miCos mentioned in this documentation are described in separate user manuals.

The latest versions of the user manuals can be obtained from our customer service department (see chapter 9).

2. SAFETY

2.1 Intended Use

The VT-80 is a laboratory device as defined by DIN EN 61010-1. It is intended for indoor use and use in an environment which is free of dirt, oil, and lubricants.

In accordance with its design, the VT-80 is intended for positioning, adjusting and shifting of loads at various velocities. The VT-80 can be mounted horizontally or vertically.

The intended use of the VT-80 is only possible in conjunction with suitable electronics. The following options are available:

1. Drive electronics and controller with suitable software
2. Combination device with suitable software

- The electronics are not included in the scope of delivery of the VT-80.
- The electronics must provide the required voltages. To ensure proper performance of the servo-control system, the electronics must be able to read out and process the signals from reference and limit switches, and from the incremental position encoder.

2.2 General Safety Instructions

The VT-80 is built according to state-of-the-art technology and recognized safety standards. Improper use of the VT-80 may result in personal injury and/or damage to the VT-80.

1. Only use the VT-80 for its intended purpose, and only use it if it is in good working order.

2. Read the user manual.
3. Immediately eliminate any faults and malfunctions that are likely to affect safety.

The operator is responsible for the correct installation and operation of the VT-80.

2.2.1 Organizational Measures

User Manual

- Always keep this user manual available when using the VT-80. If the user manual is lost or damaged, contact our customer service department (see chapter 9).
- Add all information from the manufacturer such as supplements or technical notes to the user manual.

- Only use the device on the basis of the complete user manual. If your user manual is incomplete and is therefore missing important information, serious or fatal injury as well as damage to the equipment can result.
- Only install and operate the VT-80 after you have read and understood this user manual.

Personnel Qualification

The VT-80 may only be started up, operated, maintained and cleaned by authorized and appropriately qualified personnel.

2.2.2 Measures during Installation

The VT-80 may be damaged by excessively long screws and wrongly mounted parts.

- When mounting the VT-80, make sure that the mounting screws do not interfere with the stage motion. The screw heads must not protrude from the countersunk holes.
- Observe the depth of the mounting holes in the moving platform.
- Only use screws of the correct length for the respective mounting holes.
- Only mount the VT-80 and the loads on the mounting fixtures (holes) intended for this purpose.
- The VT-80 heats up during operation. High temperatures can influence your application.
- Install the VT-80 so that your application is not affected by the dissipating heat.
- Cable extensions can affect the performance of the VT-80 and damage the electronics.
- Only use genuine PI miCos parts to connect the VT-80 to the electronic equipment.
- Do not use cable extensions. If you need longer cables, use cable extensions from PI miCos.
- Avoid short circuiting the lines for motor voltages since this can damage the electronics.

2.2.3 Measures during Start-Up

- Do not put your VT-80 into operation until it is fully mounted and connected.

Your system can be damaged by uncontrolled oscillation of the VT-80. Noise generated during operation of the VT-80 is a typical sign of oscillation.

- Immediately switch off the servo-control system of the affected stage axes.
- Check the settings of the servo-control parameters.

Moving parts attached to devices with motorized stages can accelerate rapidly and generate high forces which can cause injury or damage to equipment.

Unintentional motion of the stage is possible when it is connected to the controller for the first time. Defective software or incorrect operation of the software can also result in unintentional motions.

- Do not place any objects in areas where they can be caught by moving parts.

Collision of a part in motion at the end of the travel range and high accelerations can cause damage to or wear on the mechanical system.

- Ensure that the automatic limit switch halt is supported by the controller, or that it is activated in the controller.
- Do not disable the evaluation of the limit switch signals by the controller.
- Check the function of the limit switches at about 10 % to 20 % of the maximum velocity.
- In the event of a malfunction of the limit switches, stop motion immediately.
- Ensure that the end of the travel range is approached at low velocity.

Set the control signal so that the moving part does not stop abruptly or try to continue motion at the end of the travel range.

- Determine the maximum velocity for your application.

2.2.4 Measures during Operation

- If noise occurs during operation of the VT-80, check the settings of the servo-control parameters of your controller.

The highest dynamic force and holding force is achieved at a control signal input level of 100%; however, the motor/drive may overheat during continuous operation.

- During continuous operation at room temperature, do not exceed 90 % of the control signal level.
- For continuous operation at other temperatures, observe the maximum permissible duty cycle in relation to the ambient temperature or contact our customer service department for more information (see chapter 9).

2.2.5 Measures during Maintenance

The VT-80 is precision adjusted.
Do not loosen any sealed screws.
Dirt, oil, lubricants and condensation will render the motor/drive inoperable.

Keep the VT-80 free of dirt and condensation water.

3. UNPACKING

1. Unpack the VT-80 with care.
2. Compare the contents with the items listed in the contract and the packing list.
3. Inspect the contents for signs of damage. If there is any sign of damage or missing parts, contact PI miCos immediately.
4. Keep all packaging materials in case the product needs to be returned.

WARNING

Risk of suffocation for children. Keep the packaging foil away from children.
Dispose of packaging materials according to environmental regulations.

NOTICE

All specifications in this user manual refer only to the standard products that are included in the PI-miCos catalog. Any special features that are different, in particular special requests from customers, are supplied with the user manual as additional documentation in the form of "Technical Notes".

4. PRODUCT DESCRIPTION

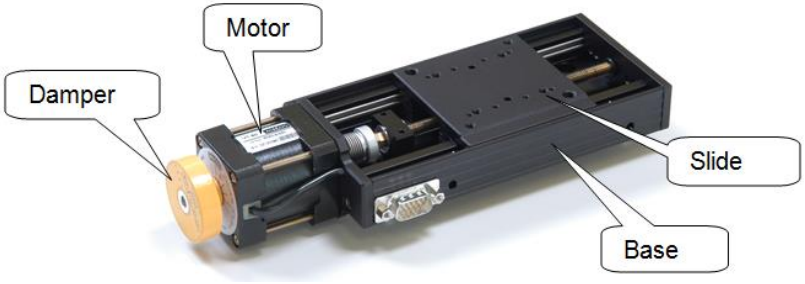
4.1 Features and Application Area

Our products are designed specifically for use in the laboratory.

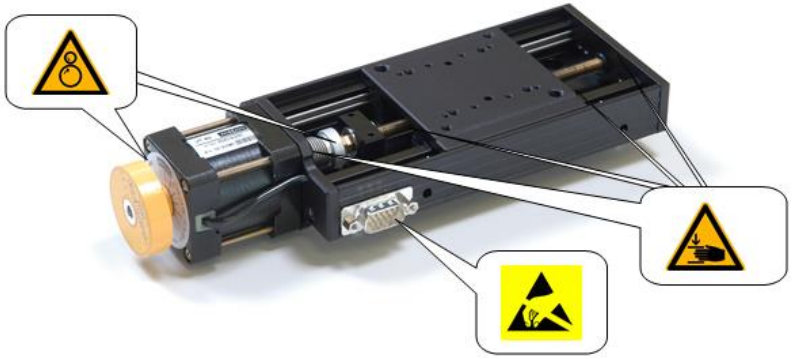
4.2 Model Overview

Order no. 6230-9-				
DC-B-026	1			
2Phase-041	2			
25 mm (xy mounted at PI miCos)		1		
50 mm		2		
75 mm		3		
100 mm		4		
150 mm		5		
200 mm		6		
250 mm		7		
300 mm		8		
Single axis			0	
25 mm xy mounted			1	

4.3 Product View



4.4 Safety Instructions



WARNING

After removing the transport lock (if present), watch out for moving parts.

NOTICE

Protect the product against mechanical damage (knocking, shock, ...).
Never start up an axis if you suspect it to be damaged or broken.
Do not disconnect or connect connectors when voltage is present.

WARNING

Risk of catching by rotating parts such as couplers and ball screws

WARNING

Risk of squeezing or crushing by moving sliders at the places illustrated.

WARNING

It is recommended that all persons entrusted with working with this product and who therefore come into contact with areas marked by the ESD warning symbol, are given training and a comprehensive explanation of the ESD warning symbol with respect to the ESD precautions.

4.5 Scope of Delivery

1. Stage according to order.
- Mounting accessories (screws & pins) in fast-sealing bag.

4.6 Optional Accessories

For optional accessories, please ask our customer service department (chapter 9) for information on possible use of adapter plates or additional Z-brackets.

4.7 Technical Features

4.7.1 Technical Features

FACTS

Load characteristics	Fx(N)	Fy(N)	Fz(N)	Mx(Nm)	My(Nm)	Mz(Nm)	kax(µrad/Nm)	kay(µrad/Nm)
DC-B-026	40	30	50	2.5	5	2.5	220	150
2Phase-041	40	30	50	2.5	5	2.5	220	150

4.7.2 Motors

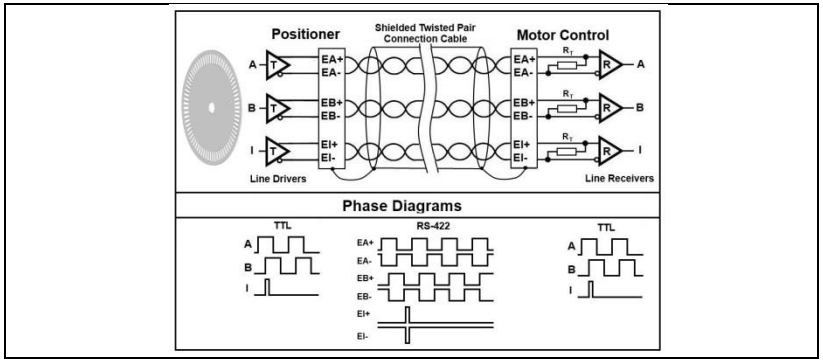
DC-B-026

Motor type		DC brush 2642-024 CR
Nominal voltage	V	24
Max. continuous current	A	1.1
Electrical resistance	Ω	5.78
Electrical inductance	mH	0.55
Torque constant	mNm/A	34.6
Velocity constant	rpm/V	276
n/M slope curve	rpm/mNm	46
No load velocity	rpm	6400
Max.continuous velocity at nominal torque	rpm	4370
Inertia	kgm^2	1.7E-6
Continuous torque	mNm	32
Rotary encoder		**RE-010** RS422 2-channel **+ index**
Encoder increments (quad counts)	n	2000

RE-010 RS422

Rotary optical encoder RS-422 quadrature

Encoder type		HEDL rotary optical encoder
Quadrature counts per revolution	n	2000
Signal output		RS-422
Channels		2 + index
Supply voltage	VDC	4.5..5.5
Current consumption, typical (Vcc = 5 V DC)	mA	57
Frequency range	KHz	100
Inertia of code disc	kgm2	0.5E-7
Operating temperature	°C	-40..100



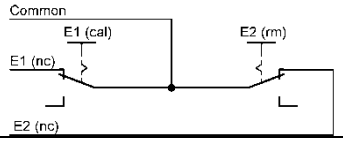
2Phase-041

Motor type		2 phase bipolar SH4018L1704
Phase current	A	1.7
Step angle	°	1.8 °
Steps	n	200
Coil resistance	Ω	1.7
Coil inductance	mH	3.3
Holding torque	mNm	260
Inertia	kgm^2	3.5 E-6
Weight	kg	0.3

4.7.3 Limit Switch

Mechanical limit switches

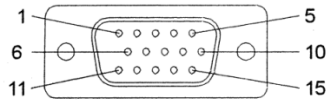
Max. voltage (resistive load)	V	30
Max. current (resistive load)	A	1
Contact type		Normal closed
Operations		$>5x10^4$
Operating temperature	°C	-40 to +85



4.7.4 Connector

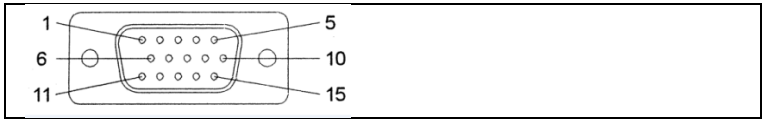
DC motor, HD15 motor pin assignment with mechanical switches

HD15m	Function	
1	EA+	Encoder channel A+
2	EB+	Encoder channel B+
3	EI+	Encoder channel I+
4	EGND	Supply encoder GND
5	nc	
6	EA-	Encoder channel A-
7	EB-	Encoder channel B-
8	EI-	Encoder channel I-
9	E5V	Encoder supply voltage
10	nc	
11	M+	DC brush motor +
12	M-	DC brush motor -
13	LE2	Limit forward
14	LE1	Limit reverse
15	LCOM	Limit common



2SM motor, HD15 motor pin assignment with mechanical sensors

HD15m	Function	
1	MA+	Motor phase A+
2	MA-	Motor phase A-
3	nc	
4	nc	
5	MB+	Motor phase B+
6	MB-	Motor phase B-
7	nc	
8	nc	
9	nc	
10	nc	
11	nc	
12	nc	
13	LE2	Limit forward
14	LE1	Limit reverse
15	LCOM	Limit common



4.7.5 Technical Data

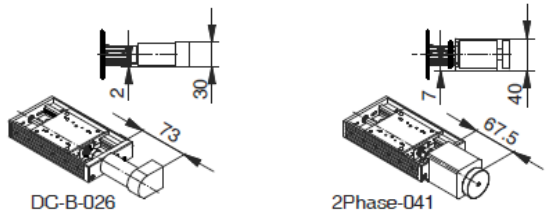
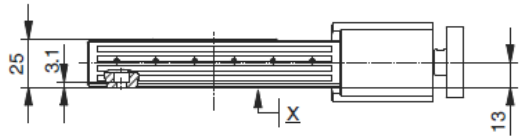
TECHNICAL DATA								
Travel range (mm)	25	50	75	100	150	200	250	300
Straightness / Flatness (µm)	± 8	± 10	± 11	± 12	± 14	± 20	± 25	± 35
Pitch (µrad)	± 100	± 110	± 120	± 130	± 150	± 170	± 190	± 210
Yaw (µm)	± 150	± 150	± 150	± 150	± 150	± 150	± 150	± 150
Weight (kg)	0.55	0.65	0.7	0.75	0.85	0.95	1.1	1.25

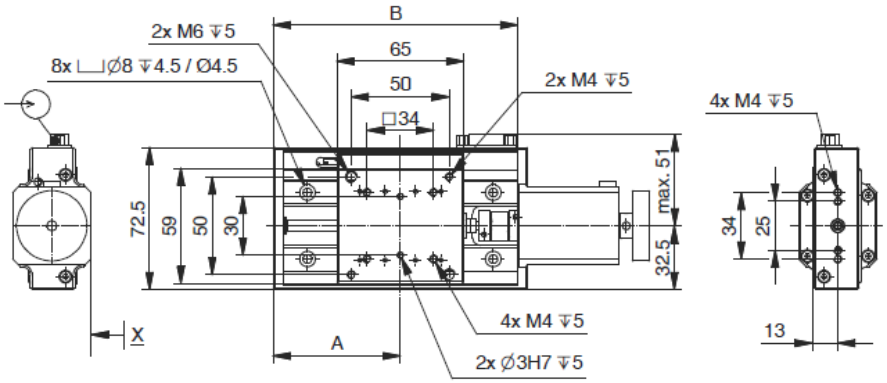
Motor (Pitch 1 mm)	DC-B-026	2Phase-041
Speed max. (mm/sec)	20	20
Resolution calculated (µm)	0.5 (RE)	5 (FS)
Resolution typical (µm)	0.5	0.2
Bi-directional Repeatability (µm)	± 10	± 10
Uni-directional Repeatability (µm)	0.8	0.4
Nominal Current (A)	0.98	1.7
Voltage Range (V)	24	

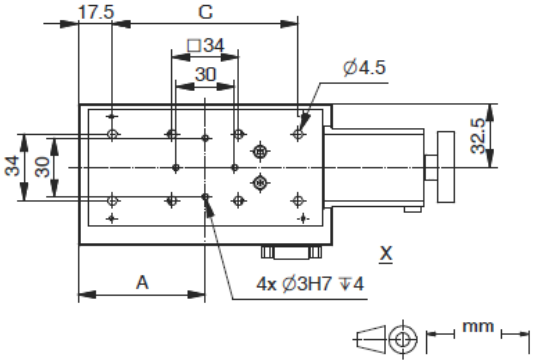
Accuracy	on request
Velocity range (mm/sec)	0.001 ... 20
Material	Aluminum, black anodized

Note: FS = full step, RE = rotary encoder
More info: Detailed information concerning motors and encoders, see appendix.

Travel(mm)	25	50	75	100	150	200	250	300
A	52.5	65	77.5	90	115	140	165	190
B	100	125	150	175	225	275	325	375
C	70	95	120	145	195	245	295	345







4.8 Ambient Conditions

For indoor use only.

- The VT-80 was calibrated at an ambient temperature of 20 °C (+/- 3 °C).
- The permissible operating temperature is between 20 °C and 40 °C.
- The permissible relative humidity is between 20% and 80%.
- Always keep the VT-80 free of dirt, dust and corrosive gases.

5. INSTALLATION

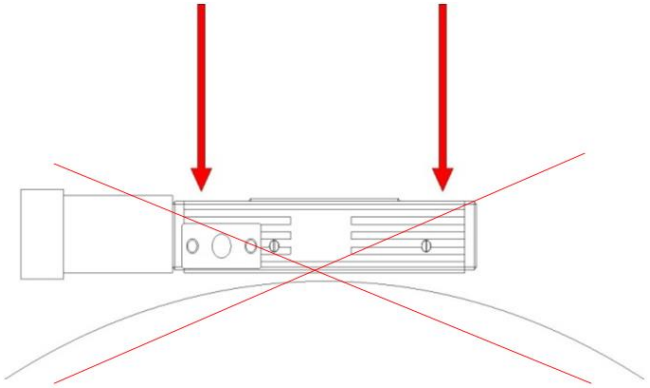
5.1 General Notes on Installation

Prerequisite

The axis must be screwed onto a surface with an evenness better than 5 µm.

It is necessary to make sure that no dust, dirt or other foreign bodies are between the surface and the axis, otherwise the properties of the axis can be impaired by mechanical tension.

To guarantee the prescribed specifications (see Internet www.pimicos.com), the evenness of the mounting surface must be better than 5 µm. (Reference surface of PI miCos measuring granite is 3 µm).



5.2 Mounting the Stage

Prerequisite

You have read and understood the general notes on installation (see chapter 5.1).

Mounting material

Screws, pins and auxiliary material or tools supplied (see chapter 4.5 "Scope of Delivery").

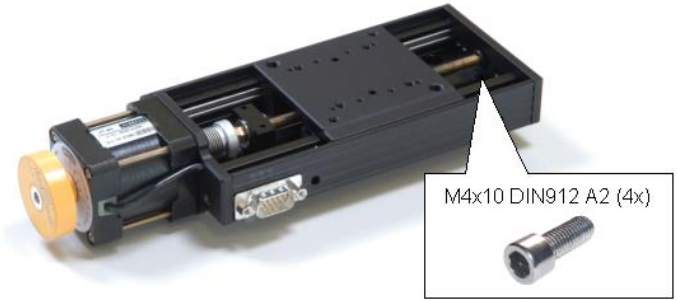
- DIN 912 screws and DIN 6325 dowel pins, m6 tolerance field

Tightening torques of the mounting screws to be used should not have values higher than the following:

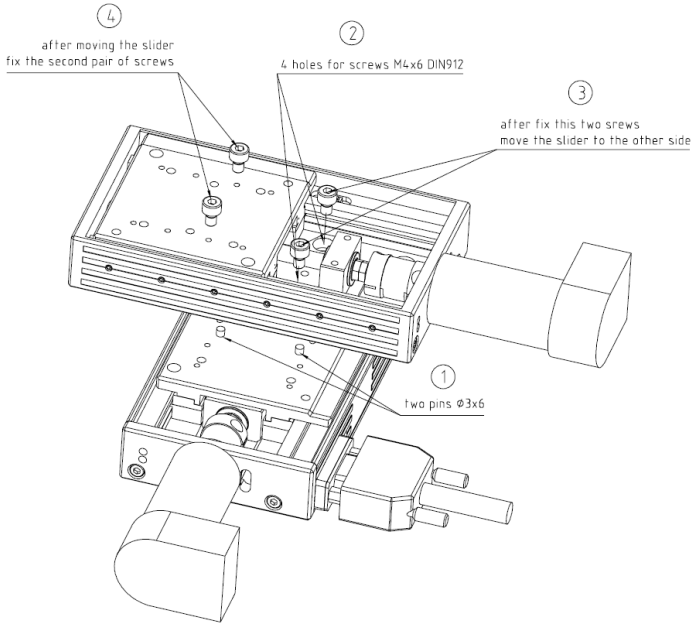
- M3 DIN 912 1.5 Nm
- M4 DIN 912 2.0 Nm
- M5 DIN 912 2.5 Nm
- M6 DIN 912 3.0 Nm

Mounting the VT-80

1. Displace the moving platform of the VT-80 to the center position by hand until all of the countersunk holes in the base body required for mounting accessible (see following illustration).
2. Mount the stage with the screws supplied.
3. Make sure that the screw heads do not protrude from the countersunk holes.



5.3 Affixing the Load



Prerequisite

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Mounting material

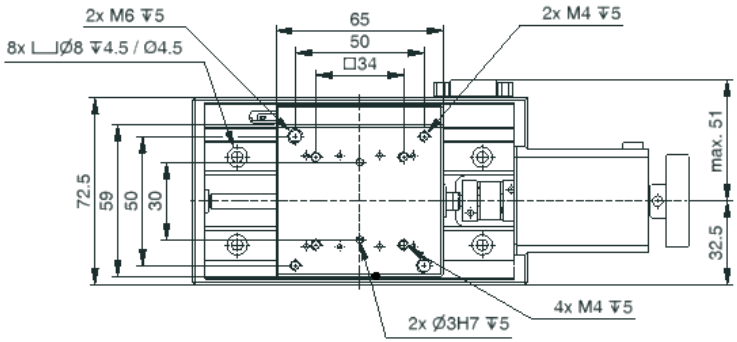
- DIN 912 screws and DIN 6325 dowel pins, m6 tolerance field

Tightening torques of the mounting screws to be used should not have values higher than the following:

- M3 DIN 912 1.5 Nm
- M4 DIN 912 2.0 Nm
- M5 DIN 912 2.5 Nm
- M6 DIN 912 3.0 Nm

Mounting the Additional Part

- Select the mounting position so that the existing fixing holes in the slider of the VT-80 can be used for the additional part to be affixed.
- Mount the additional part with the corresponding screws.



6. START-UP

6.1 General Notes on Start-Up

This stage must be started up with a suitable cable and the associated controllers.

7. MAINTENANCE

Depending on the operating conditions and the period of use of the VT-80, the following maintenance measures are required:

Maintenance run

The maintenance run is performed to redistribute the existing lubricant on the guidings of the stage.

- To evenly distribute the existing lubricant on the stage guidings, perform a maintenance run across the entire travel range after 500 hours of operation, or after 1 year at the latest.
- If you operate the translation stage continuously over a small travel range (less than 20 percent of the entire travel range), perform a maintenance run every 5000 motion cycles across the entire travel range.

Lubrication

Under laboratory conditions, the guidings of the stage need to be lubricated in exceptional cases only. For continuous industrial use, the lubrication intervals must be defined individually.

- Do not lubricate the guidings of the VT-80 without consulting our customer service department (see chapter 9).
- To lubricate the guidings, follow the instructions specified in the maintenance manual, which you can obtain from our customer service department.

8. TROUBLESHOOTING

If the problem that occurred with your system is not listed in the table above or cannot be solved as described, contact our customer service department (see chapter 9).

9. CUSTOMER SERVICE

For inquiries and orders, contact your PI miCos sales engineer or send us and email (info@pimicos.com).

If you have questions concerning your system, have the following information ready:

Product codes and serial numbers of all products in the system
Current firmware version of the controller (if present)
Software version of the driver or the user software (if present)
User operating system (if present)

10. OLD EQUIPMENT DISPOSAL

In accordance with EU directive 2002/96/EC (WEEE), as of 13 August 2005, electrical and electronic equipment may not be disposed of in the member states of the EU via the municipal residual waste.

Dispose of your old equipment according to international, national, and local rules and regulations.

In order to fulfil the responsibility as the product manufacturer, PI miCos GmbH undertakes environmentally correct disposal of all old PI miCos equipment made available on the market after 13 August 2005 without charge.

Any old PI miCos equipment can be sent free of charge to the following address:

PI miCos GmbH
Freiburger Strasse 30
79427 Eschbach, Germany

11. EU DECLARATION OF CONFORMITY

An EC Declaration of Conformity has been issued for the VT-80 in accordance with the following European directives:

2004/108/EC, EMC Directive
2011/65/EU, RoHS Directive

The applied standards certifying the conformity are listed below.

EMC: EN 61326-1:2013
Safety: EN 61010-1:2010
DIN EN ISO 12100:2010
RoHS: EN 50581:2012